

Application No. 10/686,299
Amendment dated August 23, 2005
Reply to Office Action of June 14, 2005

Amendments to the Specification:

Please replace paragraph [0005] with the following amended paragraph:

[0005] Theoretically any device that is not hermetically sealed may be detected electronically if sufficient moisture is present within the cavity of the device. It was found that sufficient moisture normally requires water vapor of greater than about 50% relative humidity. At [[his]] this level, the moisture would cause measurable instability in the diode. However, in high volume testing conditions, staging wafers in air of variable humidity occasionally allows leaky devices to escape.

Please replace paragraph [0006] with the following amended paragraph:

[0006] In existing practices, to enhance the detection of the leaky devices, water is forced into any improperly sealed devices to assure an instable diode. However, if the leak is large, the water that is forced into the leaky device is free to drain out. Once the liquid is gone, the cavity may have an opportunity to dry out, and the diode may not be measurably instable. Thus an unsealed device is not [[be]] detected.

Please replace paragraph [0011] with the following amended paragraph:

[0011] In ~~an~~other another form of the invention, the PN junction diode may be of any advantageous shape, including linear, segmented, bent, curve, oval, or circular, and may be surrounding the reservoir port.

Please replace paragraph [0023] with the following amended paragraph:

[0023] The method of the present invention employs a reverse current to flow through an exposed, unpassivated, PN junction diode in a semiconductor substrate, and a determination of an instable reverse current, similar to [[what]] that described in U.S. Patent No. 6,074,891, herein fully incorporated by reference. The method is based on the discovery that when wet or when exposed to an environment that has a relative humidity greater than about 50%, the unpassivated

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junction diode characteristics show measurable instability. Once dry, however, the junction diode's characteristics return to normal, and dry but leaky devices are not detected. The method of the present invention assures measurable humidity levels remaining in the cavity so that the junction diode can electrically identify leaky devices.

Please replace paragraph [0024] with the following amended paragraph:

[0024] Figure 1 represents a semiconductor sensor or a micro-machined device in accordance with this invention. Device 10 in Figure 1 is formed by bonding device wafer 11 to capping wafer 12, such that sensing sensor element 14 is enclosed within cavity 16, between wafers 11 and 12. Cavity 16 should be hermetically sealed, and optionally in a vacuum. Wafers 11 and 12 may be made of silicon, and device wafer 11 may be made of monocrystallographic silicon. It is contemplated that other materials may also be used. For example, the capping wafer 12 may be formed of glass, ceramic, or another semiconducting material. Sensor element 14 may be of any suitable type, including resonating structures, diaphragms and cantilevers that rely on capacitive, piezoresistive and piezoelectric sensing elements to sense motion, pressure, etc., all of which are known in the art.

Please replace paragraph [0027] with the following amended paragraph:

[0027] It is to be understood that there may be more than one reservoir provided, and each reservoir may have multiple diffusion channels connected to a plurality of reservoir ports. It is also contemplated that the reservoirs may be configured to be of varying sizes and shapes as long as they fit in the sub-surface of device wafer 11. The reservoirs are designed for receiving and retaining liquid or moisture passing through from cavity 16 through the reservoir ports and the diffusion channels. The diffusion channels may be elongated capillary tubes that can restrict the liquid movement from the reservoir(s) to the reservoir port(s), thus increase increasing the length of time the leak can be detected.